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SEVIN-4-OIL DOUGLAS-FIR TUSSOCK MOTH
PILOT CONTROL PROJECT, IDAHO, IN 1974

PRELIMINARY REPORT

by

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INTRODUCTION

In an attempt to find a suitable alternative to DDT for Douglas-fir tussock moth control, and in compliance with Environmental Protection Agency's directive to test promising materials, the U.S. Forest Service conducted a pilot test of the carbamate insecticide Sevin-4-oil in 1974.

Two units of approximately 650 acres each were sprayed with 2 pounds per acre of Sevin-4-oil in sufficient fuel oil to make three-fourths of a gallon. Spray units were located on lands owned by Potlatch, Inc., near Potlatch, Latah County, Idaho. Spray units were in the east fork of Flat Creek and Queener Creek, and the control area was located near Boundary Point.

METHODS

Test design.--The sample size was based on data from the 1973 Sevin-4-oil test in Idaho. An analysis of variance was made using pre-spray larval counts to determine the most desirable number of branches per tree, trees per cluster, and clusters per area to estimate a sample mean. By this method, the following sampling design was decided upon: two branches per tree, five trees per cluster, and 16 clusters per area.

The test was restricted to two spray blocks and one check block by the availability of good test sites and insecticide. Sample trees were mostly open-grown Douglas-fir and grand fir, 20 to 50 feet in height. Branch samples were collected from the middle one-third of the crown, using telescopic pole pruners with catch baskets attached.

Assessing foliage retention.--Each sample tree was rated as to its degree of defoliation a day before the spray areas were treated. This was done by dividing the crown into six levels and assigning a

numerical rating for each crown level, depending on the degree of defoliation; i.e., 0 = negligible, 1 = light, 2 = moderate, and 3 = heavy. The crown levels were weighted numerically to represent amount of foliage in that crown level; i.e., top one-sixth = 1, next one-sixth = 2, and the bottom one-sixth = 6. A defoliation index for each crown level was obtained by defoliation-rating X crown level. A defoliation index for the tree was arrived at by summing the defoliation indexes of each crown level. A regression analysis was made plotting the defoliation index over the prespray population level to give a prediction of the amount of defoliation that could be expected without the treatment. This was then compared to what total defoliation actually existed. The difference was attributed to the treatment. Covariance analysis was used to test differences between regression of postfeeding evaluation.

Population sampling schedule.--A prespray population sample was collected within 48 hours of spraying. Two postspray samples were collected 7 days and 14 days after spraying.

Processing samples.--All samples were processed in the field. A 3-man crew pruned the branches, placed them on a tarp, measured branch length and width, and counted all tussock moth larvae.

Insect development determination.--Instar determinations were made visually by an entomologist during the prespray sample. A prepared instar identification sheet listing the conspicuous characteristics of each instar was used.

Insecticide application.--Two pounds of Sevin-4-oil in enough fuel oil to make three-fourths gallon was applied per acre with a Bell 205 helicopter. The helicopter was equipped with 27 No. 8010 T Jet Spray Systems, Inc., spray tips directed 45 degrees forward to the thrust lines of the aircraft. A boom pressure of near 40 p.s.i. was maintained during spraying. Spraying was done at a flying speed of 90 m.p.h.

Deposit assessment.--The amount of insecticide reaching the ground in spray areas was determined by placing two oil-sensitive spray deposit cards near each sample tree. Spray deposit cards were read by the U.S. Department of Defense, Deseret Test Center, Dugway, Utah. Percent spray reaching the ground and v.m.d. of the droplets was determined.

Treatment effect determination.--The percent population reduction was determined by comparing postspray counts with prespray counts and correcting this value for natural mortality.

Egg mass survey.--An egg mass survey was made in the study areas in late September 1974. Four 5-tree clusters were sampled in each area by felling the trees, dividing the crowns into thirds, and examining four whole branches per crown level for new egg masses, old egg masses,

and cocoons. Branches were measured and converted to square inches of foliage. Number of egg masses per 1,000 square inches of foliage was computed.

RESULTS

Treatment effect on target insect.--Spray was applied July 11. Larval development at that time was 3 percent, 60 percent, and 37 percent respectively in second, third, and fourth instars. Percent population reduction corrected for natural mortality is shown in Table 1.

Table 1.--Population reduction by sample period

Area	Treatment	Prespray population density	7-day corrected percent reduction	14-day corrected percent reduction
1	Sevin-4-oil	20.21	83.15	96.77
2	Sevin-4-oil	50.91	87.76	95.53
3	Check	16.53	10.47	60.38

Spray deposit.--The average mass median diameter of the spray droplets reaching the ground was 105.98 microns for spray area 1 and 130.32 microns for spray area 2. The data is still being analyzed to determine the deposit reaching the ground.

Effect of treatment on defoliation.--A regression analysis showed that the treatment reduced expected defoliation about 50 percent (Fig. 1). A covariance analysis showed the regression lines were different at the 95 percent level of confidence. The covariance also showed no difference in the regression lines of the two sprayed areas.

Egg mass survey.--The egg mass survey showed very low egg mass levels currently exist in all three areas (Table 2).

Table 2.--Egg mass densities for Sevin-4-oil pilot control project, Potlatch, Idaho.

Area	Treatment	Egg mass density/1,000 sq. in. foliage		New to old egg mass/ratio
		Fall 1974	Fall 1973*	
1	Sevin-4-oil	0.008	0.244	1:29
2	Sevin-4-oil	.005	.261	1:52
3	Check	.014	.345	1:24

*Computed by identifying all old egg masses found in September 1974 as 1973 egg masses.

Figure 1.--Regression analysis showing differences in defoliation intensity as a result of treatment with Sevin-4-oil

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Treatments:

Spray area 1 Postfeeding $Y_1 = -.678529 + .25641 * X_1$
R = .646

35

Spray area 2 Postfeeding $Y_2 = 1.866 + .22076 * X_1$
R = .664

Checks:

Postfeeding $Y_3 = -1.72308 + .61679 * X_1$
R = .786

30

25

Defoliation index

20

15

10

5

0

Checks Postfeeding R = .786

Spray area 2 Postfeeding treatment R = .664

Spray area 1 Post feeding treatment R = .646

10

20

30

40

50

60

Prespray population level

CONCLUSIONS AND DISCUSSION

Sevin-4-oil as applied in this pilot control project gave excellent population reductions of the Douglas-fir tussock moth. More important was that expected defoliation was cut in half by the treatment. This undoubtedly prevented many trees from being permanently injured (top kill or complete mortality) as they were in a weakened condition from defoliation received in 1973.

Some problems were experienced with the mixing, formulating, and spraying of the insecticide, but these were mostly mechanical and can be corrected. Some problems encountered were:

1. Considerable variation existed in the Sevin-4-oil formulation. Two drums were extremely viscous and could not be used. The material had previously been stored for about a year, which may have caused the problem.
2. Because of the viscosity of the Sevin-4-oil, we had difficulty pumping from the drums into the mixing tank with a centrifugal pump. A positive displacement pump is needed.
3. The spray mixture is a milky white color. This caused vision problems for the spray pilot when it accumulated on the helicopter bubble. The pilot was forced to fly each swath updrift from the previous swath to avoid this hazard.